The Digital Age

- Change is accelerating
- The future is increasingly hard to predict
- Companies need to change mindset, be comfortable in a state of (r)evolution
- Experiment with new business models
- High penalties for failing to perceive shifts early
- Quickly becomes “too late…”
- Subsea has lagged, so far……

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Source: Bloomberg, Google
SUBSEA TECHNOLOGY DRIVERS

Technology is changing in key enabling areas

- Software
- Autonomy
- Communications through water
- Communications through air
- Electrification
- Batteries

Individually these would be significant, but together they will disrupt current operational and business models.
SUBSEA MARKET DRIVERS

The market is changing:

• Oil and gas drive for efficiency, as well as cyclical downturn
• Renewables – not just a new industry, but open to new thinking
• Cost competition between energy classes
• Political and social factors
• Increasing cross over into sectors such as defense, aquaculture and environment
DEVELOPMENTS IN UNDERWATER ROBOTICS
WHAT WILL HAPPEN NEXT?

Electrification, Software, Comms, Batteries

Remote Operations

Automation, Autonomy, Remote Monitoring

New Operating and Commercial Models
4G Coverage offshore UK, Norway and GoM shallow water assets

Coming soon: Dutch Sector, GoM Deepwater

Benefits: High bandwidth and low latency. Good for remote control…

Everywhere else: VSAT. Expensive for high bandwidth, inherently high latency. Not good for remote control

Also - service companies positioning themselves as comms suppliers
ELECTRIC WORK CLASS ROV

• More Efficient (85%+ compared to 55% for hydraulic)

• Smaller umbilical = smaller LARS

• More reliable in long term, essential for resident systems.

• Can be battery powered, again enabling field resident systems

• Less oil onboard
REMOTE OPERATIONS

- Enabled by Communication Networks
- Create an extension of the worksite – reduce the need for persons offshore
- An ROV “Mission” is the operation that the ROV intended to carry out (not the flight of the vehicle)
- Mission Control = Operations Control
- Remote Survey, Remote Inspection. Instant access for experts monitoring an operation
- Also pulling in technology such as AR/VR and digital twins
REMOTE PILOTING

• Currently targeted at high bandwidth comms areas (4G), particularly Norway

• Low latency of 4G comms enables mostly “standard” ROV controls to be used

• Task automation and smart ROV control will be required in other areas of the world – this is developing technology
AUVS AND FAST ROVS

• Targeted at survey and inspection applications

• 5-6x time saving over conventional ROV methods

• Still dependent on surface vessel support

• Data quality is key – processed onshore
HOVERING AUVS AND HYBRID SYSTEMS

- Vessel free inspection, survey and light intervention
- Hybrid vehicles capable of operating in ROV or AUV mode
- Fly-to-place Autonomously
- “Supervised” or Shared Autonomy for intervention tasks – human-in-loop
- Fly with mouse and keyboard, not joystick
NEW OPERATING AND DEPLOYMENT METHODS

• Platform resident vehicles, including unmanned facilities

• Temporary field resident vehicles

• Subsea resident vehicles

• ROV deployed from Unmanned Vessels
FIELD RESIDENT VEHICLES

Equinor design for a subsea charging and communication station.
NEW ENTRANTS  DISRUPTORS
WHAT IS THE GAME?
AND WHO IS THE COMPETITION?